PAIR FORMATION, NEST BUILDING, AND EGG LAYING OF THE COMMON GRACKLE IN NORTHERN OHIO[1]

GEORGE R. MAXWELL, II

Rice Creek Biological Field Station, State University College, Oswego, New York 13126

ABSTRACT

A nesting study of the Common Grackle (*Quiscalus quiscula*) on South Bass Island, Ohio, was completed during the 1964 and 1965 breeding seasons. The pair bond was achieved through two stages: (1) maintenance of contact between individuals of both sexes, and (2) acceptance of the male by the female. Multi-male "chase and leader" flights were conspicuous throughout the pair-formation period.

Length of time required for nest-building varied from seven days to eight weeks. The first egg was laid three days after the nest was completed. The eggs were laid between 0620 and 1000 hours at 24-hour intervals, and the clutch size was 4.7 eggs per nest.

Interest in blackbirds has increased during recent years, because of their expanding numbers, which seems to reflect their adaptability to a changing environment. Population dynamics, breeding biology, and behavior of the Common Grackle have attracted the attention of ecologists and is reflected in papers by Petersen and Young (1950), Eyer (1954), Jones (1969), Snelling (1968), Ficken (1963), and Wiens (1965). The objective of this study was to obtain detailed information on the breeding sequence of the Common Grackle (*Quiscalus quiscula*) in order to help fill gaps in the literature and to provide data for comparisons with future studies.

The data for this study were collected from March, 1964 to July, 1965, from an area just outside Put-in-Bay village on South Bass Island, Ohio, in western Lake Erie. The total observation time in the nesting area was approximately 500 hours.

THE STUDY AREA

The nesting area studied was located on Peach Point, a small peninsula of approximately five acres, extending northeastward from the northcentral part of South Bass Island. Most of the peninsula is owned by The Franz Theodore Stone Laboratory of The Ohio State University.

The peninsula is a park-type area containing laboratory buildings and summer cottages. Inland, the peninsula is bounded by an abandoned orchard and second-growth woods to the southwest, and by Terwilliger's Pond to the south. The dominant trees are cedar (*Juniperus virginiana*), hackberry (*Celtis occidentalis*), and sugar maple (*Acer saccharum*).

METHODS

Courtship, mating, and nesting characteristics of approximately thirty pairs of grackles were observed each year. Observations were aided by 7×35 binoculars and a 15× spotting scope. A 30-foot ladder was utilized to reach the nests. Observations of egg-laying and hatching were facilitated by the use of a 4"×6" mirror secured at right angles to the end of a 10-foot pole. With this pole mirror and binoculars, reflection of the nest's interior was easily discernable.

The egg description was derived both from observations made on eggs observed in the Peach Point colony and a comparison of these characteristics with those of 28 sets of eggs in The Ohio State Museum, using the color standards chart in Palmer (1962). Egg measurements were obtained from three sources. Eleven eggs from the Peach Point colony were measured with a vernier caliper calibrated to the nearest 0.1 mm.; 224 eggs in 50 sets from the B. R. Bales Collection at The

[1]Manuscript received August 9, 1969.

Ohio State Museum were measured by Dr. Bales; and through a personal communication with F. W. Preston of Butler, Pennsulvania, measurements were obtained from 21 eggs in his collection, obtained from Pennsylvania, Ohio, Quebec, and Alberta.

Some adult grackles were captured in a baited square-meter hardware-cloth trap, and color-banded, as an aid to recognition of individuals. The numbers given to pairs or nests, i.e. 5–65, reflects the author's designation and the year.

PAIR FORMATION

Arrival of the first grackles, the majority of which were males, at South Bass Island in 1965 occurred on 15 February. A transition from winter flocking behavior to relative pair isolation, observed during the breeding season, was gradual. The pair bond was achieved by maintenance of contact between individuals of both sexes and by acceptance of the male by the female.

The morning hours from dawn to two hours past sunrise were the times most actively devoted to pairing behavior. By the first week of April, a few pairs had achieved a stable bond and by early May most pairs had bonded and the females were engaged in nest-construction activities.

The maintenance of a close association between males and females appeared to be the most important aspect of the formation of pairs. At the initiation of close pair-formation behavior, association of a female with one or more males was evident in feeding, searching for nest materials, resting, and flying. Multi-male flights were quite common in the early stages of pair-formation. I recorded as many as five males and one female in a flight. Most of these multi-male flights were of moderate speed, with the female in the lead, like those termed "leader flights" by Ficken (1963). Some, however, were "chase flights", in which the male or males were engaged in high-speed pursuit of the female. There appeared to be little contact between the male and female during these flights, though when the male's bill made contact with the female's tail, there was a rapid change in flight direction, probably due to a fear reaction. The majority of flights which occurred during the period of pair-bond formation were initiated by the female, with one or more males joining the flight. At flight termination, the male would invariably seek a higher perch in the same or a close tree, so that he maintained a dominant position over her.

Keeling of the tail was an important display used by the male during pair formation and paired flights. In a keeled flight, the tail was strongly "V-ed" at the beginning and end of the flight. Data on keeling intensity and frequency were obtained from 27 April to 3 May, 1965, during the three hours past sunrise. Of 228 paired flights, a high degree of keeling was noted in 75 percent of the flights, moderate keeling in 14 percent of them, and no keeling in 11 percent. Keeling was less pronounced during the mid-portion of the flight, particularly in flights over 100 feet long. Keeling was most intense during the early morning hours and during pair-formation and nest-building phases. Later in the day and later in the breeding season, keeling was less frequent.

As the pair bond became increasingly established, the number of males in the multi-male flights decreased. Indication that the female had accepted a male and that the pair bond had been formed was given by variation in the activities common during the pair-formation. The flights involved only one male and one female, with the following variations in flight: (1) the female did not initiate all flights—the male initiated some flights, although not as often as the female—and (2) the male no longer strived to achieve a dominant perch at the end of the flight.

THE NEST

The colony on Peach Point contained 30 nests during each breeding season (1964 and 1965). Of these, seven nests in 1964 and six nests in 1965 were watched closely and provided most of the data for this paper.

The nest can be divided into three parts: the foundation, substage and stage. The materials used in construction consisted of woody and monocot stems, leaves, and fine grasses, the proportions of which varied somewhat in the different parts of the nest. The average nest weight, based on only four nests, was 218 grams. Details about the materials used in construction and their relative distribution throughout the different parts of the nest, the measurements, and the weights of nests appear in Table 1.

TABLE 1

Materials, Weight and Measurements of Common Grackle Nests From South Bass Island, Ohio

		Nest Subdivision		
	Total Nest	Foundation	Substage	Stage
Number of pieces of material used*				
Woody stems and leaves	27	13	14	
Monocot stems	283	103	180	
Fine stems	155	155		
Fine grasses	672		132	540
Weight (grams)*	256	148	100**	8
Measurements (cm)***				
Outside diameter	18.4			
Inside diameter (rim)	10.2			
Outside depth	15.2			
Inside depth	7.8			
Area, nest opening (sq. cm)	82.3			
Weight (gms)	218.			

*Data from one nest.
**Includes weight of decayed organic matter used to "plaster" the nest.
***Mean data from 4 nests.

The Peach Point colony was located in cedar trees. The lowest nest in the colony was seven feet high, the highest nest was 35 feet, and the median height was 20 feet. Most of the nests were placed in dense masses of foliage toward the end of a branch, or in a main fork.

The female chose the nest site, investigating most of the Peach Point area in her search for a site. After the area had been chosen, the male defended that small area in the nest tree. This area defense was limited, because the male and female did not remain close to their nest area until nest building began. Selection of a nest site was closely associated with establishment of a territory. Each grackle established a limited territory around the nest site, following a pattern that comes closest to Nice's (1941) definition of the Type D territory usually associated with colonial nesters. The strongest territorialism for the nest site was exhibited by the male during nest construction. Nest construction normally appeared to be very peaceful, with few territorial clashes. However, in some cases, it was an almost constant fight for the guarding male, this agonistic behavior being produced when two pairs chose the same or closely adjacent nesting areas. Vicious fights over this conflict of interest were observed, sometimes nearly to the death for one of the males. In such cases, both pairs commonly abandoned the area, so that high-conflict nests were usually not completed.

Each pair of grackles built a well-concealed, deep-cupped nest, which was used for one brood for one season. Much variability in nest-building behavior was evident from pair to pair. The amount of time spent on nest construction varied from a few days to over a month, also depending on pair behavior. The female collected and placed all nesting materials, while the male accompanied and guarded

her throughout the nest-construction period; however, males were also seen carrying nesting materials during nest-site selection. The earliest date that nest construction was observed was in late March, 1965, and the last day devoted to construction in the colony was 17 May, 1965. Many more nests were started than were completed and used for egg-laying. Of 11 nests under close observation during the nest-building phase, only four were completed and used.

The following summary of nest-construction activity at two nest sites gives an indication of the variability evident in nest-construction behavior. The site for nest 10–65 (Table 2) was chosen by a pair on 9 April, 1965, on which date the female carried materials to the site four times between 0655 and 0806 hours. During the following four weeks, little activity was observed at nest site 10–65, with only an occasional visit by the birds, but without construction materials. Actual nest construction began on 6 May, 1965, with six visits between 0605 and 0704 hours, or about six visits per hour. On the second day, foundation formation was continued, with 25 visits between 0721 and 0944, or about 10 visits per hour. The nest foundation was completed on the third day, with six visits per hour and an average of 62 seconds devoted to construction at each visit. On the fourth

TABLE 2

Construction Details at Nest 10–65 for the Common Grackle at South Bass Isalnd, Ohio in 1965

	Date	Time devoted to construction activity (hrs/day)	No. visits per hour	Ave. length of each visit by female (sec)
Nest site selected	9 April	1.1	4	——
Foundation constructed	6 May	1.0	6	——
	7 May	2.3	10	——
	8 May	1.1	6	62
Substage constructed	9 May	2.1	1	70
	10 May	2.8	12	78
	11 May	2.5	16	143
Stage constructed	12 May	2.5	7	194
First egg laid	15 May			

day, a substage construction started, though it was a relatively inactive day, with only three visits between 0605 and 0810 hours. The female visited the nest, carrying nesting materials, 33 times on the fifth day between 0625 and 0910, averaging 12 visits per hour. The sixth day was devoted to the decaying-plant or "plastering" (Eyer, 1954) portion of the substage construction. It was the most active day in the entire building sequence, with 40 visits from 0636 to 0905 hours. This represented an average of 16 visits per hour by the birds and resulted in the completion of the substage construction. The seventh day (12 May) was the final day of nest building; construction activity was confined to the stage or lining. There were seven visits per hour, with an average time at the nest at each visit of 194 seconds. This was the longest time spent shaping the nest during its construction. The nest was completed in seven consecutive days with a total number of 124 visits recorded during the construction. Nest building activity was limited to the hours mentioned above. Infrequent visits to the nest site were noted during two afternoons, but were not recorded. The first egg was laid on 15 May, three days after completion of the nest (Table 2).

In contrast to the above orderly building process, nest 24–65 was constructed in a sporadic fashion, beginning in late March and continuing at irregular intervals until 19 May, 1965. When I arrived at the colony in early April, the nest had a completed foundation. Work on the nest substage began on 13 April. The birds visited the site with nesting materials twice each day, 14 and 15 April, but the materials were dropped to the ground. Similar infrequent visits with no con-

struction continued until 21 April. No visits were recorded from 21–25 April. On 26 April there was one visit, but no nest construction. Building on the substage was reactivated in the early morning from 7–10 May, with an average of 6.5 visits per hour each day. No visits were observed during the period 11–17 May. On 18 May, the substage was completed. The stage was completed in one day on 19 May (as was the case with nest 10–65). The first egg was laid on 22 May, three days after completion of the nest (the same interval recorded for nests 10–65 and 8–65).

THE EGG

The appearance of the grackle egg shell is dependent upon the intensity and placement of the blackish-brown pigment over the egg surface. The absence of dark pigment, although not common, allows the egg's pearl-gray ground-color to show through unblemished. At the other extreme, the dark pigment can be so heavy that the ground-color is obscured, leaving the egg a blotched sepia. The majority of the eggs observed in this study had a pearl-gray ground-color, with streaks of blackish-brown pigmentation located variously over the surface of the egg. The dark pigment was generally more dense at the large end of the egg. Streaking varied from small spots located generally over the surface to large blotches of dark pigmentation on two or three small areas, or just to limited streaks over part of the egg surface.

Using 256 eggs from three sources, a mean length of 28.14 millimeters, a mean breadth of 20.27 millimeters, and a mean elongation (length/breadth) of 1.38 millimeters were calculated. The minimum length measured was 24.50 millimeters and the maximum length was 32.00 millimeters. The minimum breadth was 17.50 millimeters and the maximum breadth was 22.15 millimeters.

EGG-LAYING AND CLUTCH SIZE

Egg-laying times were established for 13 nests. During 1964, the earliest egg was laid on 5 May and the latest egg on 27 May in the Peach Point colony. One egg was laid approximately every 24 hours and all were laid between 0620 and 1000 hours, except one which was laid in the afternoon. Checks were made every half-hour at seven nests in the late evening and again the next morning until the egg was laid. Checks at the nests after the evening observations revealed no return of the female through the night. After no evidence of night laying was discovered, checks at six nests were made in the early morning before the egg was laid and at half-hour intervals until the egg was laid. During egg laying, the eggs remained cold until the last egg in the clutch was laid.

The maximum number of eggs found in a completed set was five and the minimum number was three. The mean clutch size for 18 nests in the Peach Point colony was 4.3, which is lower than the 4.5 given by Eyer (1954) and the 4.9 given by Petersen and Young (1950). A summary of 187 nests and 881 eggs from this study and from literature sources yielded a mean clutch size of 4.7 (Table 3).

DISCUSSION

One of the most interesting findings during this study was the variability evident in nest construction behavior of grackle pairs. One pair constructed their nest in seven consecutive days and another pair built their nest sporadically over an eight-week period, yet the construction methods used during the actual building of these two nests were similar. The behaviors concerned with nest-construction methods were rigid, with little variation from pair to pair, but the behavior concerned with the timing of nest building was variable. A similar situation exists in the behavior of other species, as shown by my studies on heron-preening behavior (Maxwell and Putnam, 1968). The preening techniques and positions used by black-crowned night herons were similar from bird to bird, but there was a large amount of variability in the timing and sequence of areas preened. Behavior

TABLE 3

Clutch Size of the Common Grackle Based on 187 Incubated or Full Clutches

Area	Authority	No. Eggs in Clutch	No. Nests
Pennsylvania	Bales Coll. (Ohio State Museum)	5	5
Ontario	Bales Coll. (Ohio State Museum)	4	2
	" "	5	2
	" "	6	1
	" "	7	1
Minnesota	Bales Coll. (Ohio State Museum)	4	1
Wisconsin	Petersen and Young (1950	3	3
	" "	4	9
	" "	5	36
	" "	6	6
	"	7	1
	Buss and Mattison (1955)	4	2
	" "	5	5
Ohio	Bales Coll. (Ohio State Museum)	3	2
	" "	4	21
	" "	5	18
	" "	6	3
	Ohio State Museum	3	2
	" "	4	13
	" "	5	10
	" "	6	2
	"	7	1
	Trautman (1940)*	4	8
	" "	5	8
	" "	6	4
	" "	7	1
	Davie (1898)	7	2
	Present Study	3	4
	" "	4	4
	" "	5	10
		Mean—4.7	

*Trautman's (1940) figures include clutches and young.

TABLE 4

Summary of Common Grackle Egg Measurements From the Dr. B. R. Bales Collection at the Ohio State Museum, F. W. Preston Laboratories and South Bass Island, Ohio

	Bales (all eggs)	Bales (one/set)	Preston	South Bass Island	All Eggs
Length					
Total Length (mm)	6,263.00	1,367.75	616.00	324.30	7,203.30
No. of Eggs	224	50	21	11	256
Mean Length (mm)	27.96	27.91	29.33	29.50	28.14
Variance	1.72	1.62	1.47	4.77	1.80
Standard deviation	1.31	1.27	1.21	2.18	1.34
Range					24.50–32.00
Breadth					
Total Breadth (mm)	4,509.25	988.25	445.78	234.60	5,189.63
No. of Eggs	224	50	21	11	256
Mean Breadth (mm)	20.13	20.16	21.22	21.33	20.27
Variance	0.53	0.58	0.39	0.51	0.52
Standard Deviation	0.73	0.76	0.63	0.71	0.72
Range					17.50–22.15
Elongation					
Length/Breadth (mm)	1.38	1.38	1.38	1.38	1.38

patterns which are rigid, as in these examples, are probably innate, while those behavior patterns with variability must be partly, if not wholly, learned.

Using egg measurements from three sources, I calculated a mean length of 28.14 millimeters, and a mean breadth of 20.27 millimeters. These average measurements are comparable with those in Bent (1958), who reported a mean length of 28.85 millimeters and a mean breadth of 21.95 millimeters for 20 eggs. Preston, in Palmer (1962), found that time could be saved by measuring one egg, chosen at random, from each set, instead of measuring all eggs in a set. Using the Bales Collection and accompanying data, I found that the mean length for all eggs from 50 sets was 27.96 millimeters and the mean breadth 20.13 millimeters. These figures are nearly identical to the 27.91 millimeters length and 20.16 millimeters breadth obtained by measuring one egg at random (using random numbers table) per set. These measurements are compared in Table 4.

SUMMARY

This study of pair-formation, nest building, and egg laying of the Common Grackle was conducted during 1964 and 1965 on South Bass Island, Ottawa County, Ohio. Pair-formation began shortly after the arrival of the females to the breeding ground and continued, in some cases, into the nest-building phase. The transition from winter flocking-behavior to summer pair-formation was gradual.

The pair bond was achieved through two stages: (1) maintenance of contact between individuals of both sexes, and (2) acceptance of the male by the female. Multi-male "chase and leader" flights were conspicuous throughout the pair-formation period. Flights involving as many as five males and one female were common earlier in the season, while flights of two males with a female were more common toward the end of pair-formation. The female initiated most of these flights, and the male tried to achieve a dominant perch at the end of the flight.

Length of time required for completion of nest construction varied from seven consecutive days to eight weeks. In the cases of three different nests, the first egg was laid three days after the nest was completed. Egg-laying times were observed at 13 different nests. The eggs were laid at 24-hour intervals between 0620 and 1000 hours. A mean clutch size of 4.7 was determined from 187 nests and 881 eggs, based on data from the Peach Point colony supplemented by the literature.

ACKNOWLEDGEMENTS

This study was supported by a National Science Foundation Summer Fellowship for Graduate Teaching Assistants in 1964, an Ohio State University Muellhaupt Fellowship in 1964–65, and an Ohio State University Osburn Fellowship in 1965. All this support is gratefully acknowledged. Special thanks go to Dr. L. S. Putnam, for his dedicated guidance and encouragement.

LITERATURE CITED

Bent, A. C. 1958. Life histories of North American blackbirds, orioles, tanagers, and allies. U. S. Natl. Mus., Bull. 211: 1–549.

Buss, I. O. and **H. M. Mattison.** 1955. A half century change in bird populations of the Lower Chippewa River, Wisconsin. Milwaukee Public Mus., Publ. in Ornithology, No. 1. The North American Press, Milwaukee.

Davie, O. 1898. Nests and eggs of North American birds. Fifth edition, The Landon Press, Columbus, Ohio, 509 pp.

Eyer, L. E. 1954. A life-history study of the Bronzed Grackle. Unpub. Ph.D. thesis, Mich. State Univ., 213 pp.

Ficken, R. W. 1963. Courtship and agonistic behavior of the Common Grackle. Auk 80: 52–72.

Jones, H. P. 1969. The common grackle—a nesting study. Ky. Warbler 45(1): 3–8.

Maxwell, G. R. and **L. S. Putnam.** 1968. The maintenance behavior of the black-crowned night heron. Wilson Bull. 80(4): 467–478.

Nice, M. M. 1941. The role of territory in bird life. Am. Mid. Nat. 26(3): 441–487.

Palmer, R. S. 1962. Handbook of North American Birds. Yale Univ. Press, New Haven. Vol. 1, vii+567 pp.

Petersen, A., and **H. Young.** 1950. A nesting study of the Bronzed Grackle. Auk 67: 466–476.
Snelling, J. C. 1968. Overlap in feeding habits of Redwinged Blackbirds and Common Grackle nesting in a cattail marsh. Auk 85: 560–585.
Trautman, M. B. 1940. The birds of Buckeye Lake, Ohio. Misc. Publ. Mus. Zool., Univ. of Mich., No. 44, 466 pp.
Wiens, J. A. 1965. Behavioral interactions of Red-winged Blackbirds and Common Grackles on a common breeding ground. Auk 82: 356–374.